Leica RM2235

Rotary Microtome

Instruction Manual

Leica RM 2235
V1.1 English - 02/2005
Always keep this manual with the instrument.
Read carefully before working with the instrument.

Leica
MICROSYSTEMS

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For the instrument serial number and year of manufacture, please refer to the name plate at the back of the instrument.

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Symbols in the text and their meanings

Dangers, warnings and cautions appear in a gray box and are marked by a warning triangle ⚠.

Notes, i.e. important user information appear in a gray box and are marked by an information symbol ℹ.

(5) **Numbers in parentheses refer to item numbers in illustrations.**

Intended use of instrument

The Leica RM2235 is a manually operated rotation microtome for creating thin sections of specimens of varying hardness for use in routine and research laboratories in the fields of biology, medicine and industry.

They are designed for cutting soft paraffin specimens as well as harder specimens, as long as they are suitable for being cut manually.

Any other use of the instrument is considered improper!

Qualification of personnel

- The Leica RM2235 may be operated by trained laboratory personnel only.
- All laboratory personnel designated to operate the Leica instrument must read this instruction manual carefully and must be familiar with all technical features of the instrument before attempting to operate it.

Instrument type

All information provided in this manual applies only to the instrument type indicated on the cover page.

An identification label indicating the instrument serial number is attached at the left side of the instrument.

Fig. 1

Be sure to comply with the safety instructions and warnings provided in this chapter. Be sure to read these instructions, even if you are already familiar with the operation and use of other Leica products.

2.1 Safety notes

This instruction manual contains important instructions and information regarding the operational safety and maintenance of the instrument.
The instruction manual is an important part of the product, which must be read carefully prior to startup and use and must always be kept near the instrument.

If additional requirements on accident prevention and environmental protection exist in the country of operation, this instruction manual must be supplemented by appropriate instructions to ensure compliance with such requirements.

This device has been built and tested in accordance with the directive for machines, 98/37/EC, and the safety regulations governing laboratory apparatus.

The following standards serve as a basis:

- DIN EN ISO 12100-1: 2003
- DIN EN ISO 12100-2: 2003
- DIN EN 61010-2-101: 2002
- DIN EN ISO 9001: 2000.

In order to maintain this condition and ensure safe operation, the operator must observe all the instructions and warnings contained in this instruction manual.

The protective devices on both instrument and accessories may neither be removed nor modified. Only service personnel qualified by Leica may repair the instrument and access the instrument's internal components.

2.2 Warnings

The safety devices installed in this instrument by the manufacturer only constitute the basis for accident prevention. Primarily responsible for accident-free operation is above all the owner of the instrument and, in addition, the designated personnel who operates, services or cleans the instrument.
To ensure trouble-free operation of the instrument, make sure to comply with the following instructions and warnings.

Warnings - Safety instructions / warning labels attached to the instrument

- **Safety instruction labels on the instrument marked with a warning triangle indicate that the correct operating instructions (as described in this manual) must be followed when operating or replacing the instrument component bearing the label.**

  Failure to adhere to these instructions may result in an accident, personal injury, damage to the instrument or accessory equipment.

Warnings - Transport and installation

- **Once removed from the crate, the instrument may only be transported in an upright position.**
- **Do not transport the instrument by holding it by the handwheel grips, coarse driving wheel or the knob for setting the section thickness.**
- **The protective devices on both instrument and accessories must neither be removed nor modified.**

Warnings - Working at the instrument

- **Take care when handling microtome knives and disposable blades. The cutting edge is extremely sharp and can cause severe injury!**
- **Always remove the knife / blade before detaching the knife holder from the instrument. Always put the knives back into the knife case when not in use!**
- **Never place a knife anywhere with the cutting edge facing upwards and never try to catch a falling knife!**
- **Always clamp the specimen block BEFORE clamping the knife.**

Warnings - Working at the instrument

- **Prior to manipulating the knife and specimen, or changing the specimen or knife, and during breaks, always lock the handwheel and cover the cutting edge with the knife guard!**
- **ALWAYS rotate the handwheel clockwise. Otherwise, the locking mechanism will not work properly.**
- **Always wear protective glasses when sectioning brittle specimens. Specimen may splinter!**
- **Specimen blocks must not be oriented during the retraction phase! If a block is oriented during retraction, the block will advance by the retraction value PLUS the selected section thickness before the next section. This may cause damage to both specimen and knife!**

Warnings – Cleaning and maintenance

- **Always lock the handwheel before cleaning!**
- **Do not use any solvents containing acetone or xylene for cleaning!**
- **Ensure that no liquids enter the interior of the instrument when cleaning!**
- **When using detergents please comply with the safety precautions of the manufacturer and with the applicable laboratory regulations.**

2.3 Integrated safety devices

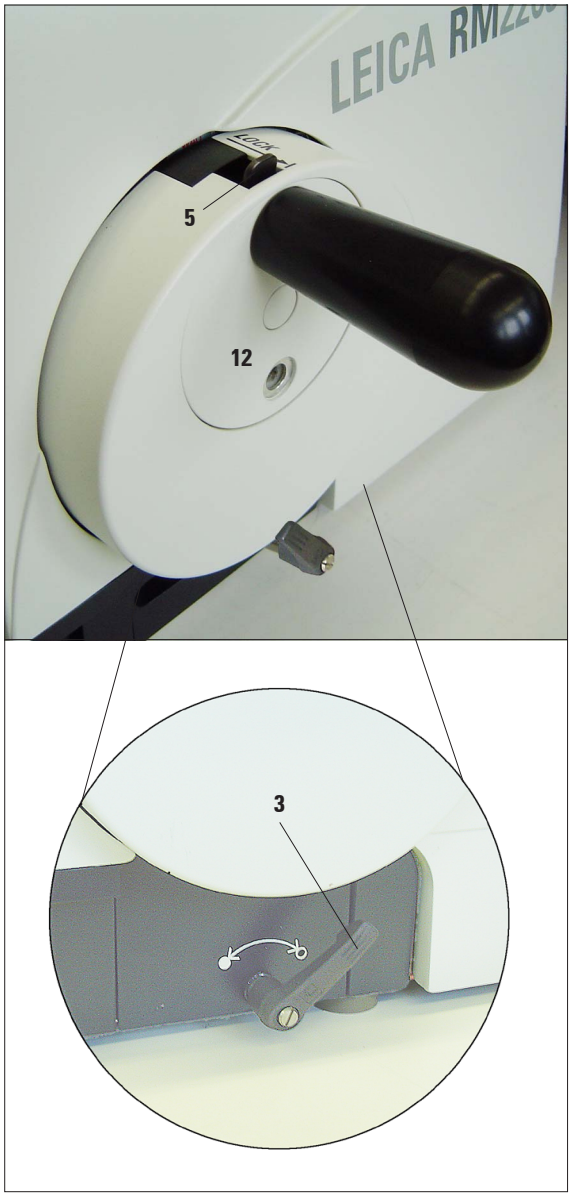


Fig. 2

Locking the handwheel

There are two ways of locking the handwheel (**12**):

Using the lever (**3**) on the right side of the microtome base plate, the handwheel can be braked in almost any position.

- To brake, rotate the lever in a counterclockwise direction to position ●.

Caution!
The braking lever (3) must be exactly in position ●, so that the handwheel brake is applied correctly.
If the lever is moved beyond this point, it is possible that the handwheel is no longer braked.

- To unlock the handwheel brake turn the lever (**3**) back to its original position. Position ○.

- To lock the handwheel, press the lever (**5**) outwards and continue to turn the handwheel slowly until it locks exactly in the 12 o'clock position.

In either case, the yellow LED in the **LOCK** field (**4**) lights up and the instrument cannot be started.

If both braking systems are used simultaneously, always bring the lever (3) into position ○ first to release the brakes. Otherwise it is possible that the lever (5) cannot be unlocked.

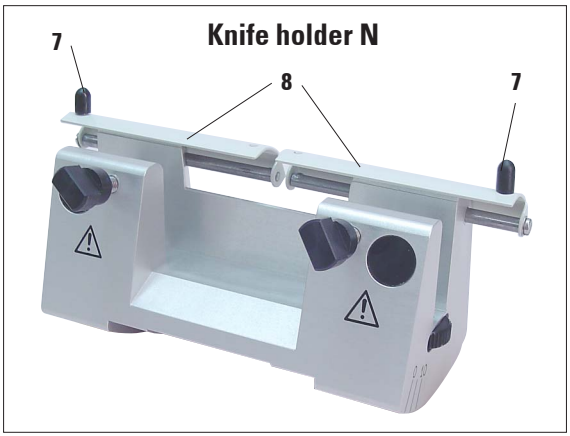


Fig. 3

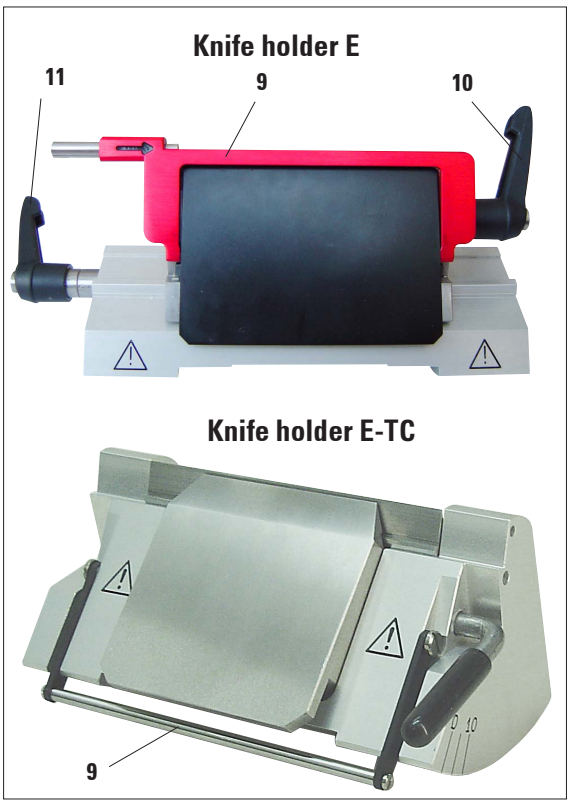


Fig. 4

Knife guard on the knife holder

Each knife holder is equipped with a tightly mounted knife guard (**8**, **9**). This makes it possible to cover completely the cutting edge in every knife or blade position.

Knife holder N/NZ

The knife guard (**8**) of the knife holder N/NZ can be easily positioned via the two buttons (**7**) (Fig. 3).
To cover the knife edge, push both cover strips of the knife guard to the center.

Knife holder E/E-TC

The knife guard on knife holder E/E-TC consists of a red foldaway handle (**9**). To cover the cutting edge, fold the knife guard handle (**9**) upwards as illustrated in Fig. 4.

The clamping levers on the knife holder E are not interchangeable.
The two clamping levers (10, 11) must remain in the position shown at all times, as otherwise isolated malfunctions of the knife holder can occur.
Clamping lever for the blade (10) at the right, clamping lever for the lateral displacement (11) at the left.

3.1 Overview - instrument components

Tray

Universal cassette clamp

Handwheel locking mechanism

Knife holder base, without lateral movement feature

Smooth-turning handwheel

Removable section waste tray

Lever for activating the handwheel brake

Clamping lever of the knife holder base

Directional fixture for specimen clamps

Window for displaying the section thickness

Coarse driving wheel

Adjusting knob for setting the section thickness

Lever for activating the mechanical trimming function

Knife holder E

Clamping lever for lateral movement function of knife holder

Fig. 5

3.2 Instrument specifications

Basic Instrument with mechanical trimming, with lateral coarse feed (clockwise (CW) or counter clockwise (CCW)) without specimen orientation

The Leica RM2235 rotary microtome features low-maintenance and backlash-free precision micrometer feed system with horizontal feed and vertical stroke mechanism based on self-lubricating cross roller bearings.

For increased user safety, the instrument isequipped with two independent handwheel lockingsystems.

The instrument is equipped with a Leica-patented operator-adjustable force balancing system with spring compensation of the forces which occurduring the sectioning process.

Advantages: no need of a heavy counter balance in the handwheel and possibility to adapt the spring force to specimen clamps and specimens of different weights.

A patented specimen retraction system can be switched ON/OFF by the operator, a feature, which provides the full advantage of an instrument with specimen retraction while at the same time making it easy to operate the instrument in the 'rocking mode' (if the in strument is used in the 'rocking mode', we recommend to switch the specimen retraction OFF).

The coarse feed wheel is within easy reach of the operator.

(more information to direction of rotation see chapter 5.1.2)

3.3 Technical data

General

Approvals:	The instrument-specific marks are located on the rear panel of the instrument next to the name plate
Operating temperature range:	+10 °C to +35 °C
Storage temperature range:	+5 °C to +55 °C
Relative humidity:	max. 80%, non-condensing
Humidity in storage loaction:	< 80 %
Section thickness range:	1.0 - 60.0 µm
Section thickness settings :	from 1.0 - 10.0 µm in 1.0 µm increments from 10.0 - 20.0 µm in 2.0 µm increments from 20.0 - 60.0 µm in 5.0 µm increments
Specimen feed:	approx. 30 mm
Vertical stroke:	70 mm
Maximum sectioning area w/o retraction:	69 mm (without specimen orientation 1 µm)
Maximum sectioning area with retraction:	62 mm
The specimen retraction:	200 µm; can be turned off manually.

Dimensions and weight

Width (including handwheel):	413 mm
Depth (including waste tray):	618 mm
Height (total):	305 mm (with tray on the housing)
Working height (knife blade):	168 mm (measured from the table)
Weight (without accessories)	approx. 37 kg

Optional equipment and optional accessories

Specimen orientation (option)	
horizontal:	8°
vertical:	8°
Angle of rotation:	± 90°
Trimming stages :	10 µm, 50 µm
Repositioning of knife holder base	
north-south:	± 25 mm

4.1 Standard delivery

The Leica RM 2235 standard delivery includes:

1 Leica RM2235 basic instrument	
1 Handwheel, complete	0500 38181
1 Section waste tray	0502 37931
1 Tool set consisting of:	0500 38600
1 Allen key with handle, size 5	0194 04760
1 Allen key with handle, size 4	0194 04782
1 Allen key size 3	0222 04138
1 Screwdriver 3 x 50, 186 long	0170 11568
1 Bottle (50 ml) of oil for drives, type 405	0336 06086
1 Dust protective cover	0212 30350
1 Brush with magnet	0183 40426
1 Operating manual G/E/F/S	0700 37115

The accessories ordered are included in a separate box.
Carefully check the delivery against the packing list and the delivery note. Should there be any discrepancy, please contact the Leica selling unit handling your order.

4.2 Installation site requirements

- Stable, vibration-free laboratory bench with horizontal and even stage plate; practically vibration-free floor.
- No other instruments nearby which might cause vibrations.
- Room temperature permanently between + 10 °C and + 35°C.
- Obstruction-free access to the handwheel.

Never operate the instrument in rooms with explosion hazard.

Setting up the instrument

Do not transport the instrument by holding it on the handwheel shaft, the object head or the housing!

- By holding the instrument (**5**) at the front by the baseplate, and at the rear by the recessed grip (Fig. 6), lift it out of the molded cushion (**6**) of the packaging and place it on a stable laboratory table.
- The two sliding elements (**9**) located on the rear of the base plate make it easier to move the instrument on the table.

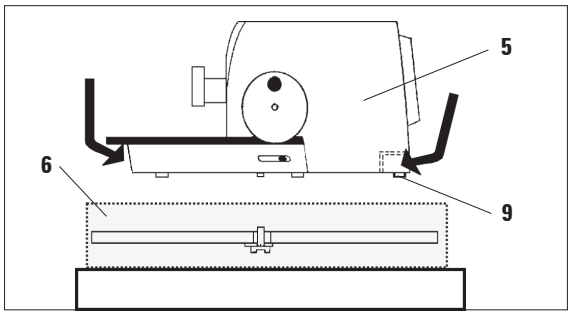


Fig. 6

- To move the instrument, hold it by the front of the base plate, lift it up gently and slide it on its slides.

4.3 Assembling the handwheel

The handwheel has to be assembled before attempting to use the instrument.
The necessary parts and tools can be found in the toolkit supplied together with the instrument.

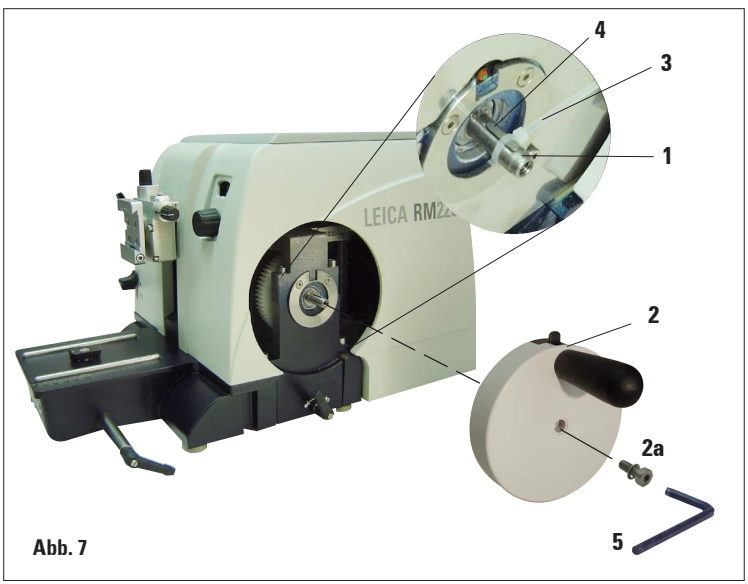


Abb. 7

The feather key (**4**) is loosely placed in the handwheel shaft (**1**) and fixed in place with a tie-rap during transport.

- Remove the cable tie (**3**).
  Caution!
  Make sure not to lose the feather key!
- Place the handwheel (**2**) on the handwheel shaft (**1**) as shown.
- Tighten the screw (**2a**) located in the center hole of the handwheel with an Allen key size 4 (**5**).
- Remove the cover foil from the self-adhesive cover disk and fix the cover disk on the handwheel.

4.4 Inserting the universal cassette clamp

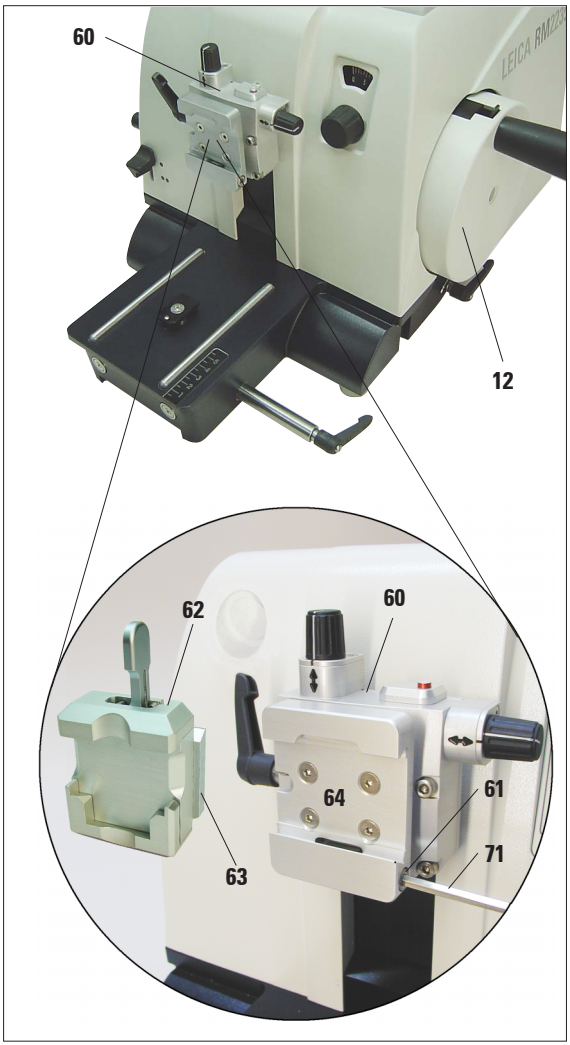


Fig. 8

There are two versions of the specimen holder, one with and one without specimen orientation, which are interchangeable.
The object orientation allows for simple position correction of the specimen surface when the specimen is clamped into place.

You can use the quick clamping system (**64**) to hold all available accessory specimen clamps (for more information, see Chapter 6 “Optional accessories”).

To do so, proceed as follows:

- Move the object head (**60**) to the upper end position by turning the handwheel (**12**) and engage the handwheel lock.
- To release the clamping system, turn the screw (**61**) of the quick clamping system (**64**) counterclockwise using an Allen key size 4 (**71**).
- Push the guide (**63**) of the universal cassette clamp (**62**) from the left into the quick clamping system (**64**) as far as it will go.
- To clamp the cassette clamp turn the screw (**61**) clockwise as far as it will go.

Since all stage clamps available as accessories are equipped with the same kind of guide on the back, they are inserted in the same way described here using the example of the cassette clamp.

4.5 Inserting the knife holder

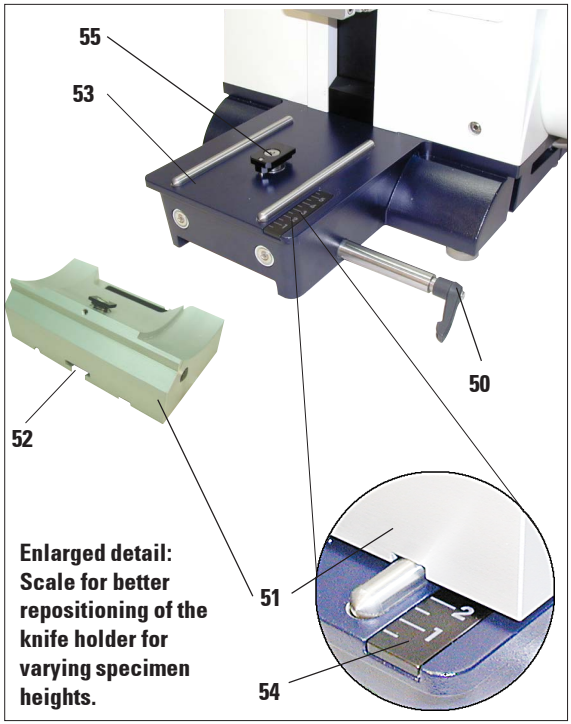


Fig. 9

Setting up the knife holder base

- Release the clamping lever (**50**) by rotating it counterclockwise.
- Insert the knife holder base (**51**) using the notch (**52**) on the bottom into the T-piece (**55**) of the microtome base plate (**53**).
- To secure the knife holder base, turn the clamping lever (**50**) clockwise.

The knife holder base (**51**) can be moved back and forth on the microtome base plate. This allows bringing the knife holder to optimal cutting position in relation to the specimen.

There is a scale (**54**) on the right side of the microtome base plate. This enables faster and better positioning of the knife holder at the specimen if various combinations of standard specimens and specimen holders are used. The rear edge of the knife holder base (**51**) functions as the scale reference.

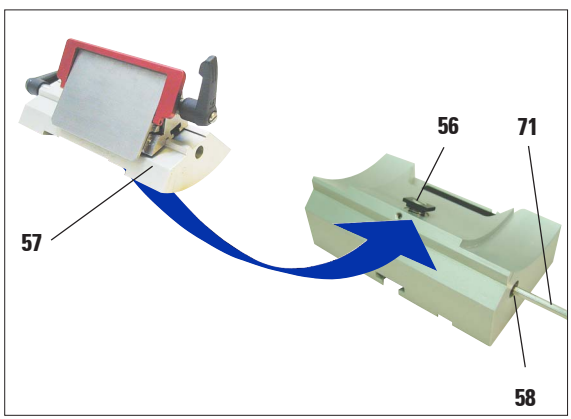


Fig. 10

Inserting the knife holder

- Release the screw (**58**) with the size 4 Allen key (**71**) (part of the delivery package) so that the knife holder (**57**) can be moved.
- Place the knife holder (**57**) with the underside groove onto the T-piece (**56**) of the knife holder base (**51**).
- To clamp, retighten the screw (**58**).

5.1 Operating elements and their functions

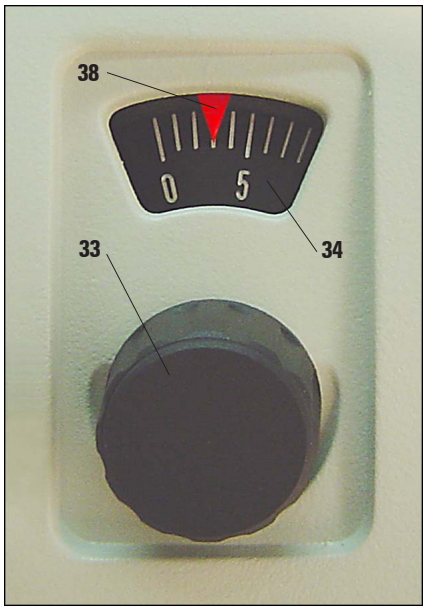


Fig. 11

Fig. 12

5.1.1 Section thickness setting

The section thickness is set by turning the adjusting knob (**33**) at the front of the microtome on the right.
The adjusting knob has a notch for each value that can be set.

Setting range: 1 - 60 µm
from 1 - 10 µm in 1 µm increments
from 10 - 20 µm in 2 µm increments
from 20 - 60 µm in 5 µm increments.

The section thickness set in each case is displayed in the window (**34**).
The selected section thickness (on the scale) must agree with the red pointer (**38**)

5.1.2 Coarse driving wheel

The instrument can be ordered with clockwise or counterclockwise rotation. The given direction of rotation means “forwards” and relates to the feed movement of the specimen towards the knife.
The coarse motion serves for a fast horizontal forwards movement of the object - towards the knife - and backwards - away from the knife.
When reaching the rear/front end positions, the coarse driving wheel can only be turned with difficulty. In the front end position, no more feed motion takes place.

The coarse driving wheel also turns during sectioning. Therefore it must not block whilst the handwheel is being turned during sectioning; otherwise, no feed motion can take place and thus also no sectioning.

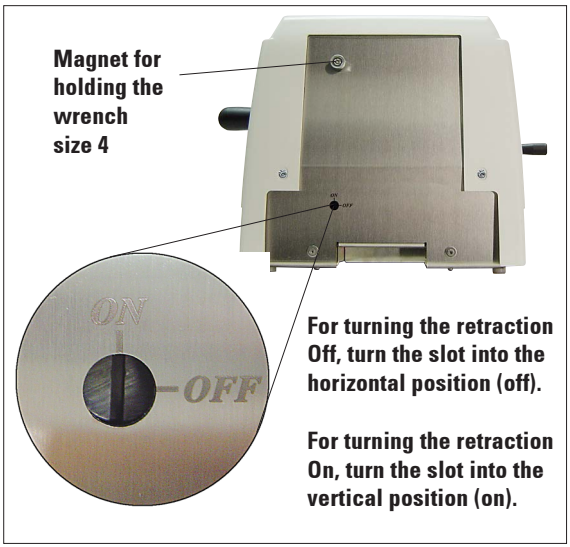

Magnet for holding the wrench size 4
ON
OFF
For turning the retraction Off, turn the slot into the horizontal position (off).
For turning the retraction On, turn the slot into the vertical position (on).

Fig. 13

5.1.3 Specimen retraction

The specimen retraction serves for protecting the knife and the specimen. When the retraction is switched on, the object is drawn back 200 µm into the upper end position after the sectioning stroke during the return movement. Before the feed motion of the new section thickness, the feed motion for the retraction value takes place.
The specimen retraction can be switched off manually at the back of the instrument (Fig. 13), if required, using the slotted-screwdriver supplied with the delivery.
Before switching the specimen retraction On and Off, run the object head to the upper end position by turning the handwheel.

Fig. 14

5.1.4 Mechanical trimming function

The RM 2235 is fitted with a mechanical trimming function. The trimming lever has 3 notching positions (0,10 µm, 30 µm).

The points (**36**) mark the two trimming stages:

● = 10 µm
●● = 30 µm

- For activating the trimming function, press the lever downwards into one of the two notching positions and keep depressed. After each rotation of the handwheel, a feed motion of 10 µm or 30 µm takes place.
- After letting go of the lever, it automatically springs back to its original position (zero position). The trimming function is thereby deactivated.

The section thickness that has been set is not added to the selected trimming value.
If the section thickness that has been set is greater than the selected trimming value, the section thickness is fed.

5.1.5 Specimen holder with precision orientation

In the quick clamping device of the specimen holder fixture with precision orientation, all object clamps available as optional accessories can be used (implemented).

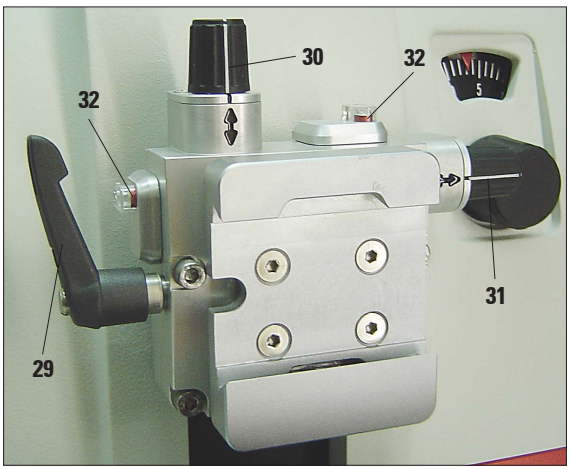


Fig. 15

Display of the zero position

For better display of the zero position, the orientation has two red indicators (**32**).

When both indicators are visible and both setscrews are in zero position at the same time (notch point, white marking on "↕"), the specimen is in zero position.

When the large standard clamp (50 x 55 mm) is used, the specimen orientation of 8° in north-south direction is no longer possible.
The usable angle is only about 4° in this case.

The object orientation allows for simple position correction of the specimen surface when the specimen is clamped into place.

Orienting the specimen

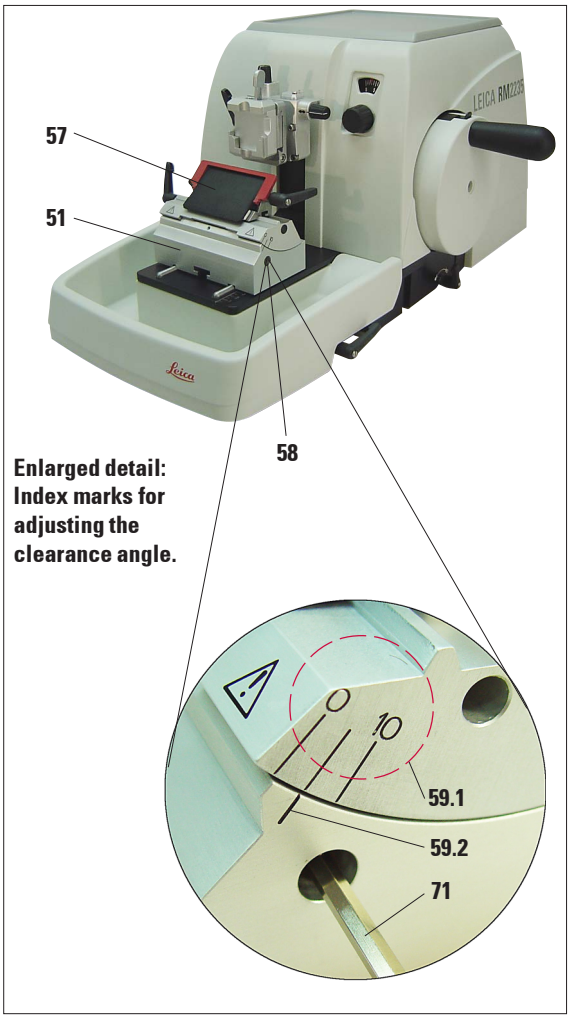
Specimen blocks must not be oriented during the retraction phase!
If a block is oriented during retraction, the block will advance by the retraction value PLUS the selected section thickness before the next section.
This may cause damage to both specimen and knife!

- Raise the object head to the upper end position and activate the handwheel lock.
- To release the clamp, turn the eccentric lever (**29**) forwards.
- Turn setscrew (**30**) to orient the specimen in north-south direction. Turn setscrew (**31**) to orient the specimen in east-west direction.

  Each complete turn of the screw inclines the specimen by 2°. A total of 4 complete turns = 8° are possible in every direction. The accuracy is approximately ± 0.5°.

  For ease of estimation, there is a white marking on the handle and a notch point that is noticeable during turning.
- To lock the current orientation, turn the eccentric lever (**29**) backwards.

5.2 Adjusting the clearance angle



Enlarged detail: Index marks for adjusting the clearance angle.

Fig. 16

- The index marks (0°, 5° and 10°) for adjustment of the clearance angle (**59.1**) are located on the right side of the knife holder (**57**).
- There is also an index mark (**51**) on the right side of the knife holder basis (**59.2**) which serves as a reference point when adjusting the clearance angle.
- Release the screw (**58**) with the size 4 Allen key (**71**) so that the knife holder (**57**) can be moved.
- Move the knife holder until the index mark of the desired clearance angle coincides with the reference line on the knife holder base.

  Example:
  Enlarged detail showing a clearance angle setting of 5°.

The recommended clearance angle setting for knife holder E is approx. 5°.

- Hold down the knife holder in this position and retighten the screw (**58**) for clamping.

Fig. 17

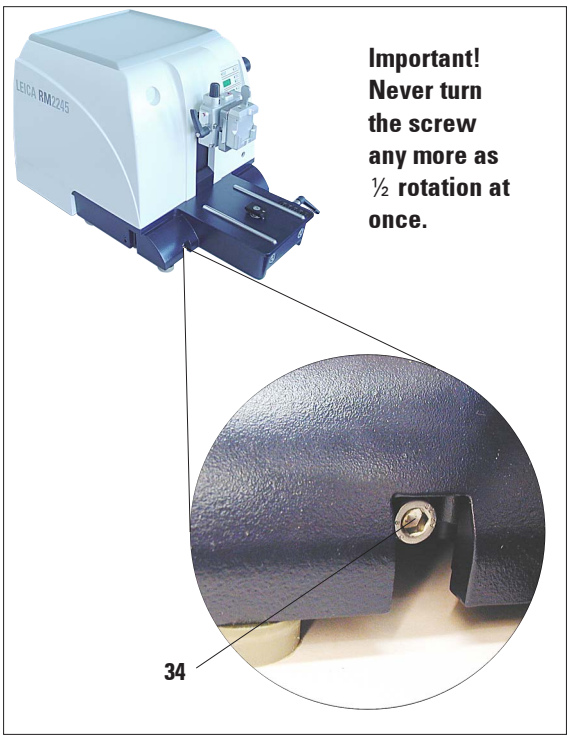


Fig. 18

5.3 Fine adjustment of the mass balance

If a specimen clamp which is lighter or heavier than the previous specimen clamp is mounted to the object head (**33**), it is necessary to check whether the force balancing system must be re-adjusted.

Checking the correct balance adjustment:

- Mount the new clamp and clamp the specimen.
- Turn the handwheel until the specimen head is located in center position (halfway up); let go of the handwheel (Fig. 17).

If the specimen head remains exactly in position, the setting is correct.
If the specimen head moves upwards or downwards, a fine adjustment is necessary.

If the force balancing system is not-adjusted correctly, work injuries may be the result.

The adjustment is carried out via screw (**34**), which is located on the underside of the microtome base plate and can be accessed by removing the section waste tray. Use the 5 mm Allen key (with handle) to adjust the screw.

- If the specimen head has moved **downward**, rotate the screw **clockwise** through approx. ½ turn and check whether the specimen head remains stable.
- If the specimen head has moved **upward**, rotate the screw **counterclockwise** through approx. □ turn and check whether the specimen head remains stable.
- Continue turning the screw until the specimen head remains exactly in position.

5.4 Clamping the specimen

Always clamp the specimen block BEFORE clamping the knife. Lock the handwheel and cover the knife edge with the knife guard prior to any manipulation of knife or specimen, prior to changing the specimen block and during all work breaks!

- Rotate the handwheel until specimen clamp is in the uppermost position.
- Block the handwheel (allow lever (5) Fig. 2 to notch) and activate the brake.
- Insert a specimen block into the specimen clamp.

A detailed description for inserting the specimen into various object clamps and specimen holders is provided in Chapter 6, "Optional accessories".

5.5 Clamping the knife / disposable blade

Be very careful when handling microtome knives or blades. The cutting edge is extremely sharp and can cause severe injury!

- Carefully insert knife or disposable blade into the knife holder and clamp.
- Make sure that the blade is clamped parallel to the upper edge of the pressure plate.
  (For more information see Chapter 6.2.2, Fig. 28)

A detailed description for inserting the blade or the knife into the individual knife holders is provided in Chapter 6, "Optional accessories".

5.6 Sectioning

Always rotate the handwheel clockwise at a uniform speed. Otherwise, the locking mechanism will not work correctly.
The rotation speed of the handwheel must be adapted to suit the hardness of the specimen.
For harder specimens, use a slower speed.

Cutting into the specimen (trimming)

- Run the specimen to the rear end position by turning the coarse driving wheel.
- Push the knife holder on the knife-holder base almost until it is just before the object.
- Orientate the position of the specimen surface (only in the case of specimen holders that can be orientated).
- Release the handwheel lock, or handwheel brake, respectively.
- Using the trimming lever select the required trimming stage.
- Begin the cutting process by turning the handwheel.
- Stop the cutting process when the required specimen level has been reached.
- Let go of the trimming lever.

Remove the sections

- Set the required section thickness, or check the value setting on the display, respectively.

Always use a different area of the cutting edge for trimming and cutting.

- To do so, laterally displace the blade or knife in the knife holder. When using the knife holder E with lateral movement, it is sufficient to move the knife holder sideways.
- For sectioning, turn the handwheel evenly in a clockwise direction.

Take care not to block the coarse driving wheel when turning the handwheel!
Otherwise there will be no feed motion of the section thickness and thus no sectioning will occur.

- Pick up the sections and mount them on microscope slides.

5.7 Changing the specimen or interrupting sectioning

Lock the handwheel and cover the knife edge with the knife guard prior to any manipulation of knife or object head, as well as prior to changing the specimen block and during all work breaks!

- Raise the specimen to the upper end position and activate the mechanical handwheel lock.
- Cover the cutting edge with the knife guard.
- Remove the specimen from the specimen clamp and mount a new sample to continue.
- Run the object clamps with the coarse driving wheel back far enough until the new specimen can start being cut.

5.8 Finishing daily routine

- Raise the specimen to the upper end position by turning the handwheel and engage the handwheel lock.

Always remove the knife / blade before detaching the knife holder from the instrument.
Always put the knives back into the knife case when not in use!
Never place a knife anywhere with the cutting edge facing upwards and never try to catch a falling knife!

- Remove the blade from the knife holder and insert it in the receptacle at the bottom of the dispenser, or remove the knife from the knife holder and put it back in the knife case.
- Remove the specimen from the specimen clamp.
- Push all section debris into the section waste tray and empty the tray.
- Switch off the instrument main switch.
- Clean the instrument (see Chapter 8.1).

6.1 Installing the fixture for specimen clamps

Depending on each invidiidual order, the basic instrument is delivered with either an orienting or non-orienting fixture for specimen clamps, which needs to be installed on the microtome by the user. Both fixtures are compatible with all specimen clamps available as accessories.
Prior to installing the fixture on the specimen arm, lock the handwheel locking mechanism.

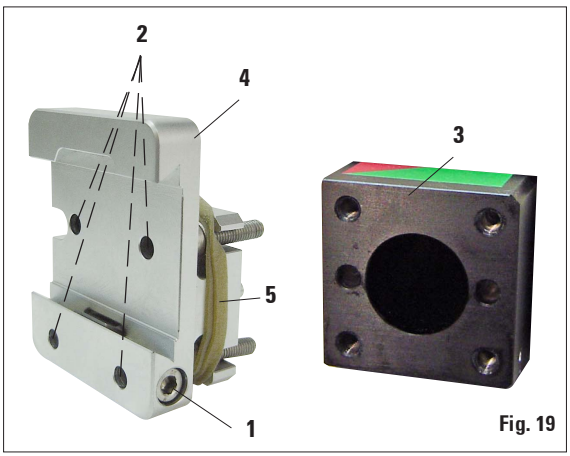


Fig. 19

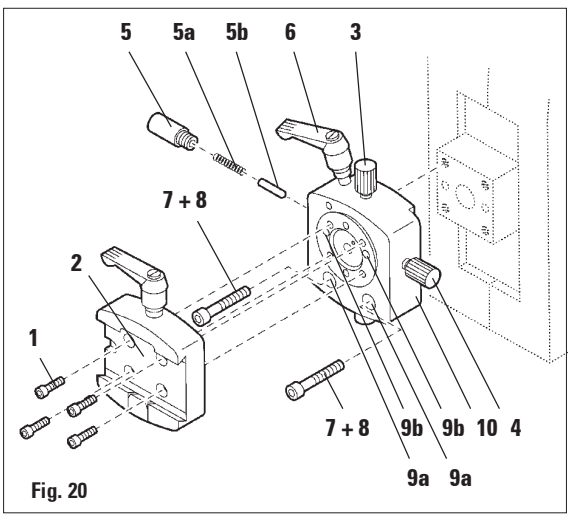


Fig. 20

- Finally, place dove tail guide (**2**) onto fixture and tighten 4 screws (**1**) with a 3 mm Allen key.

6.1.1 Non-orienting fixture f. spec. clamps

- Fasten the non-orienting fixture for specimen clamps (**4**) to the specimen head (**3**):
  Remove screw (**1**), place fixture (**4**) onto the specimen head (**3**) from the the front and tighten screws (**2**) with the 3 mm Allen key.
  Then insert screw (**1**) from the side and tighten slightly with the 4 mm Allen key.

Do not remove the rubber ring before the fixture has been fastened to the specimen head.

6.1.2 Orienting fixture f. specimen clamps

- Loosen eccentric bolt (**6**) rotating it counterclockwise.
- With a screw driver, unscrew pressure device (**5**) completely and pull it out together with spring (5**a**) and pin (**5b**).
- Completely unscrew adjusting screws (**3**) and (**4**).
- Place orienting fixture onto specimen head as shown on the left.
- Insert screws (**7+8**) into bore (2 screws (**8**) can be accessed through bore (**9a**)) and tighten screws evenly with 3 mm Allen key.
- Insert spring (**5a**) and pin (**5b**), with the flatter side facing forward into pressure device (**5**). Tighten pressure device (**5**) completely with a screwdriver.
- Retighten adjusting screws (**3+4**) completely.

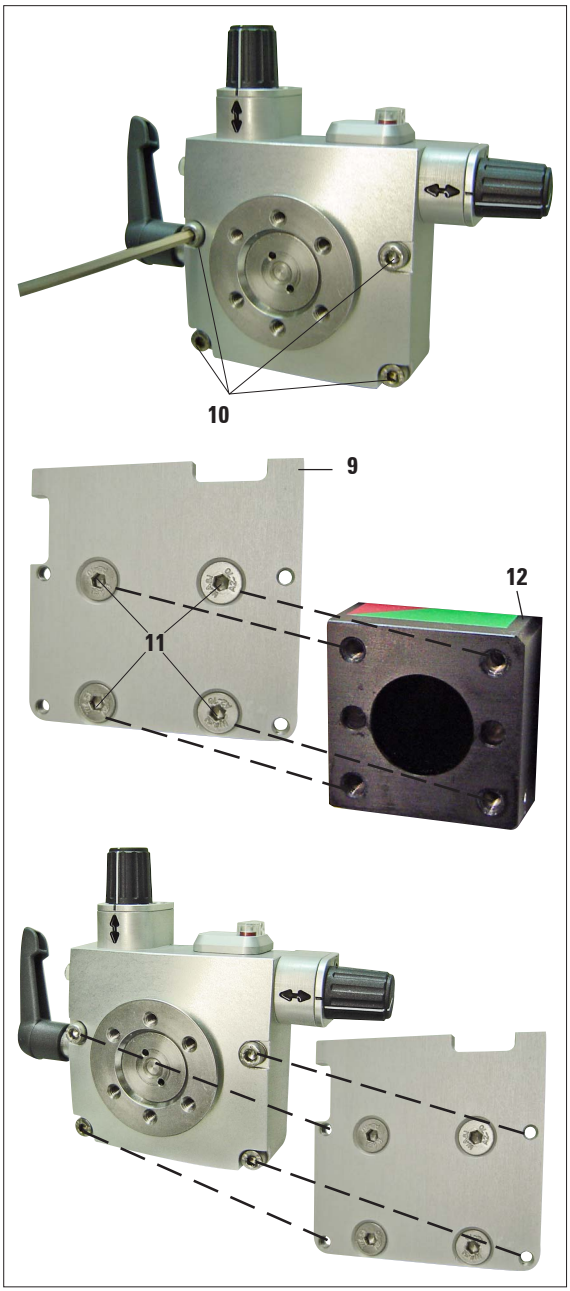


Fig. 21

6.1.3 Fixture for specimen clamps with precision orientation

- Prior to installing the fixture with precision orientation, loosen 4 screws (**10**) (3 mm Allen key) and carefully detach the fixture for specimen clamps from base plate (**9**).

- Fasten the base plate to specimen head (**12**) with a 3 mm Allen key and 4 screws (**11**) (delivered together with fixture with precision orientation).

- Now fasten the fixture with precision orientation to the specimen head with 4 screws (**10**) and 3 mm Allen key.

When the fixture with precision orientation is not in use, store the base plate, 4 screws (11) and fixture with precision orientation together in the same place.

Fig. 22

6.1.4 Quick-clamping system

The quick-clamping system is a specimen clamp used together with either the fixture for specimen clamps with precision orientation and zero reference point indicators or with the orienting fixture for specimen clamps.

- Use a 2.5 mm Allen key to insert and tighten 4 screws (**13**) in bore A.

6.2 Specimen clamps and holders

All object clamps available as accessories can be integrated into either the directional or non-directional specimen holder fixture.

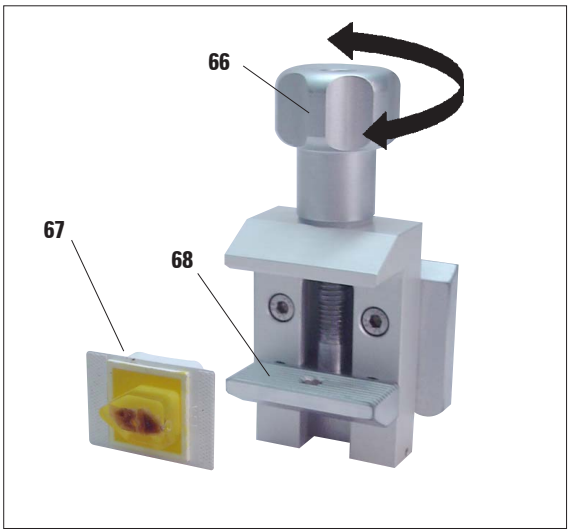


Fig. 23

6.2.1 Standard specimen clamp

The standard object clamps are available in two sizes: 40 x 40 mm and 50 x 55 mm.
It is designed for direct clamping of rectangular blocks. In addition, it accommodates the foil clamps.

- Turn the knurled screw (**66**) counterclockwise to move the movable jaw (**68**) downward.
- Mount the sample (**67**) as required.
- Turn the knurled screw (**66**) clockwise to move the movable jaw upward against the fixed jaw to securely clamp the sample.

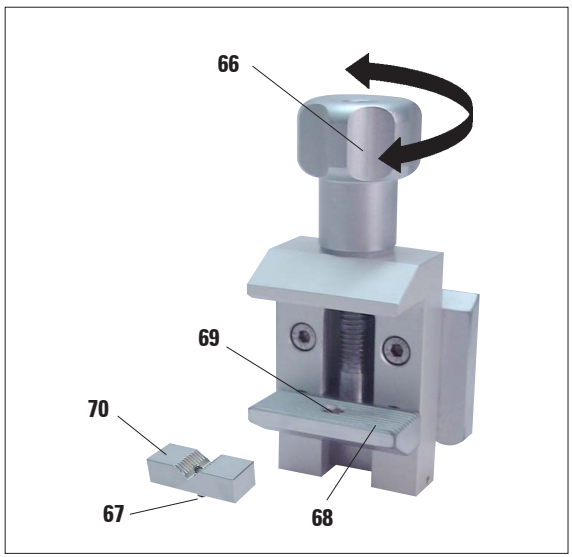


Fig. 24

6.2.2 Vee insert

The vee insert (**70**) is mounted in the hole provided in the lower movable jaw of the standard specimen clamp.
This enables to clamp round specimens in the standard specimen clamp.

- Turn the knurled screw (**66**) counterclockwise to move the movable jaw (**68**) downward.
- Insert the pin (**67**) of the vee insert (**70**) in the hole (**69**) of the lower jaw (**68**).
- Mount the sample as required.
- Turn the knurled screw (**66**) clockwise to move the movable jaw with the vee insert upward against the fixed jaw to securely clamp the sample.

6.2.3 Foil clamp type 1

This foil clamp is appropriate both for clamping very small foil pieces and flat, angular samples. It is mounted in the standard specimen clamp.

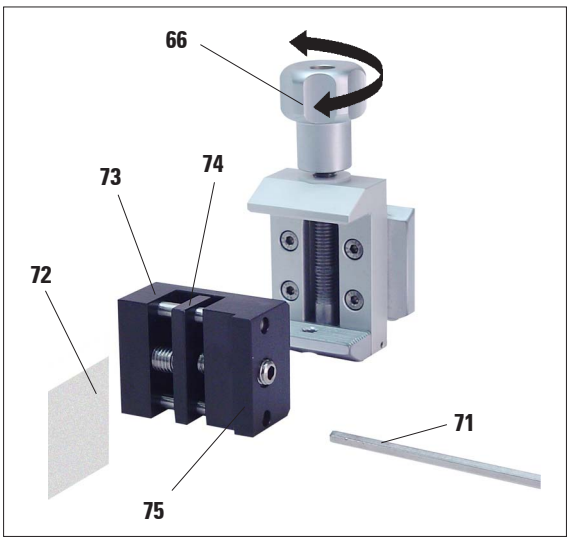


Fig. 25

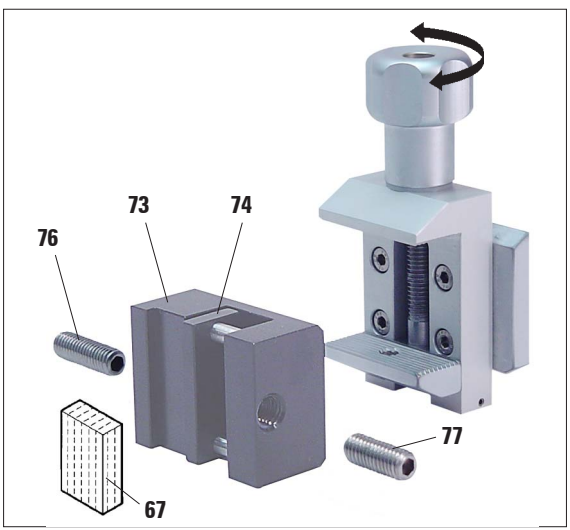


Fig. 26

Clamping of foil pieces

- Move the movable jaw (**74**) to the right as required by turning the set screw with an Allen key size 4 (**71**).
- Place the foil (**72**) between the movable jaw (**74**) and the fixed jaw (**73**).
- To clamp the foil, screw the movable jaw (**74**) against the fixed jaw (**73**) by using the Allen key.
- Insert the foil clamp (**75**) in the standard specimen clamp as shown.
- Turn the knurled screw (**66**) clockwise to clamp the foil clamp in the standard specimen clamp.

Clamping of flat samples

To clamp angular samples, replace the long set screw (**76**) with the short set screw (**77**) provided with the foil clamp.

- Unscrew the long set screw (**76**) on the left with an Allen key size 4 (**71**).
- Screw the short set screw (**77**) in the hole.
- Place the sample (**67**) between the movable jaw (**74**) and the fixed jaw (**73**).
- To clamp the sample, screw the movable jaw (**74**) by turning the set screw (**77**) against the fixed jaw (**73**).
- Insert the foil clamp in the standard specimen clamp as shown.
- Turn the knurled screw (**66**) clockwise to clamp the foil clamp in the standard specimen clamp.

6.2.4 Foil clamp type 2

This foil clamp is appropriate for large foil ribbons.
It is mounted in the standard specimen clamp.

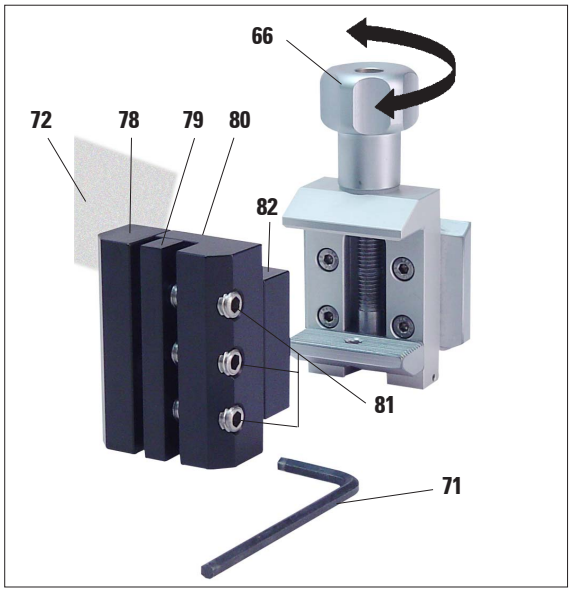


Fig. 27

- To open the jaws (**78**) and (**79**) lightly loosen the 3 screws (**81**) with an Allen key size 4 (**71**).
- Insert the foil (**72**) from behind to position it between the movable jaw (**79**) and the fixed jaw (**78**).
- To clamp the foil, first tighten the screw in the middle and then the other two screws (**81**) with the Allen key (**71**).
- Place the foil clamp (**82**) in the standard specimen clamp so that the beveled surface (**80**) on the back of the foil clamp points to the right or left.
- Turn the knurled screw (**66**) clockwise to securely clamp the foil clamp in the standard specimen clamp.

6.2.5 Universal cassette clamp

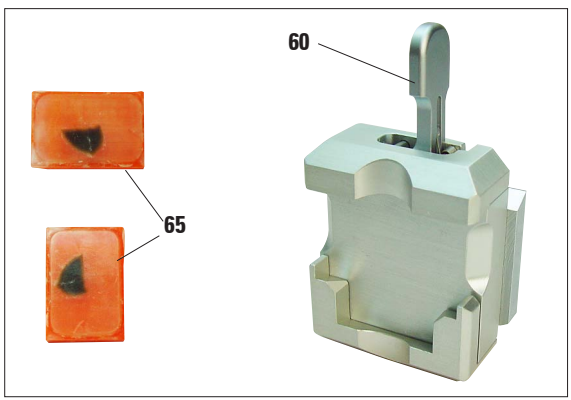


Fig. 28

The universal cassette clamp (UCC) is designed to for horizontal or vertical clamping of all kinds of commercial cassettes.

- Push the lever (**60**) to the left.
- Mount the cassette (**65**) horizontally or vertically as required.
- To clamp the cassette, push the lever (**60**) to the right.

6.2.6 Super Mega cassette cla mp

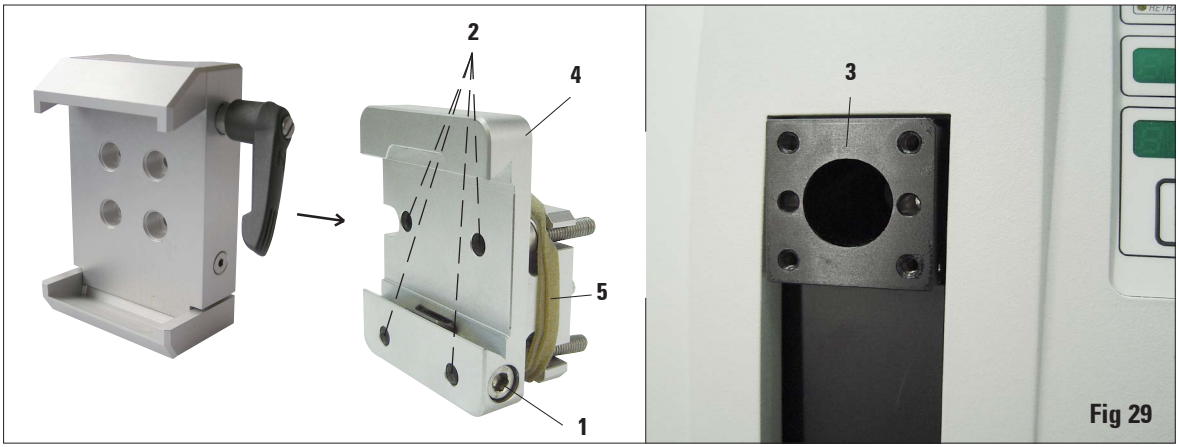


Fig 29

Installing the SuperMega cassette clamp

The SuperMega cassette clamp should preferably be used together with the non-orienting fixture for specimen clamps.
To install the SuperMega clamp, proceed as follows:

First, install the clamp on the specimen head, then remove the rubber ring (5) (do not remove the rubber ring first!).

- Screw the non-orienting fixture for specimen clamps (**4**) onto the specimen head (**3**):
  Remove screw (**1**), then put fixture (**4**) on specimen head (**3**) from the front. Tighten screws (**2**) with Allen key no. 3.

  Insert screw (**1**) from the side and tighten slightly with Allen key no. 4.
- Insert the SuperMega cassette clamp from the left side into the dovetail guide of the non-orienting fixture for specimen clamps and tighten screw (**1**) completely.

If the orienting fixture for specimen clamps is used with the knife holder base without lateral adjustment, the orientation mechanism must be in position „0“ and the cover of the backlighting must be removed (otherwise, the different parts will collide).
Never use the SuperMega cassettes together with the backlighting system!

6.2.7 Holder for round specimens

The holder for round specimens is designed to accommodate cylindrical samples. Inserts for specimens of 6, 15 and 25 mm diameter are available.

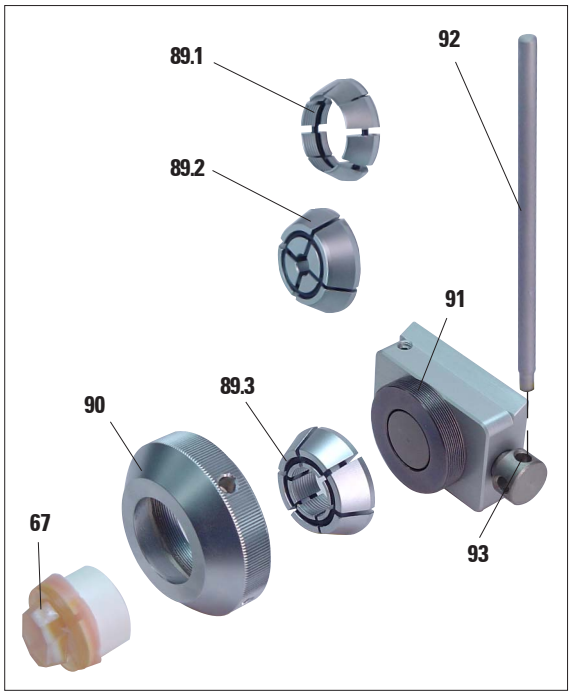


Fig. 30

- To mount the required insert (**89.1-3**) turn the clamping ring (**90**) counterclockwise and remove.
- Place the required insert into the tension ring (**90**) and screw the tension ring (**91**) onto the thread by turning it clockwise.
- Mount the sample (**67**) and fix by turning the clamping ring (**90**) clockwise.
- To orient the inserted sample, insert the pin (**92**) into the bore (**93**) and rotate it counter-clockwise to release the clamp. You can now rotate the specimen so that the side you want faces upwards.
- To lock it in the position you have chosen, tighten the pin (**92**) by turning it clockwise.

6.3 Knife holder base and knife holder

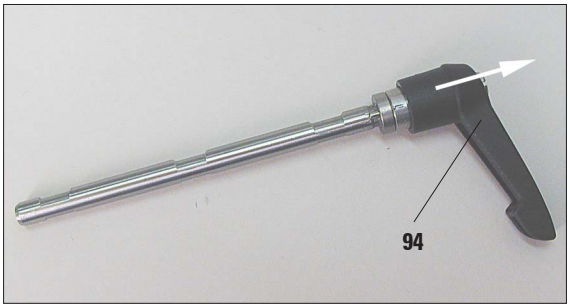


Fig. 31

The plastic handles of all clamping levers on the instrument and knife holders can be turned to the position that is most convenient for each user.

Pull the grip (**94**) out of the lever, hold it in this position, and rotate it to the desired position. It will then lock automatically when released.

6.3.1 Knife holder base, without lateral movement feature

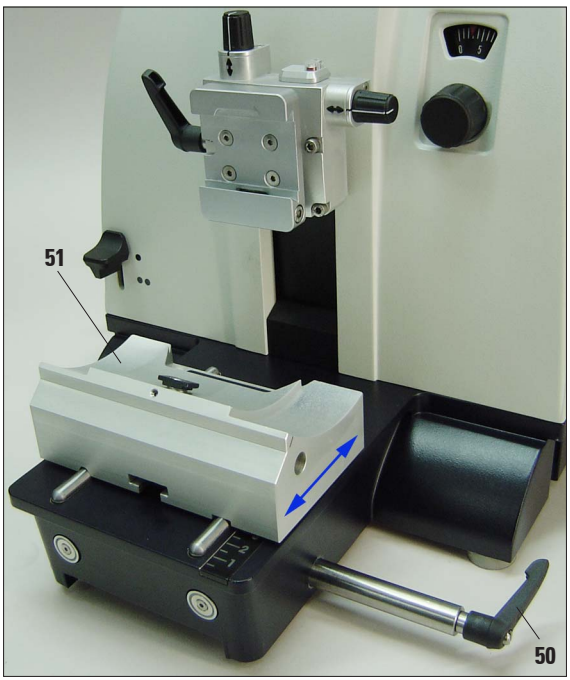


Fig. 32

Repositioning the knife holder base

The one-piece knife holder base (rigid) (**51**) can be moved forwards and backwards on the microtome base plate.

This vertical displacement allows bringing the knife holder into the optimal cutting position in relation to the specimen.

- To release, rotate the clamping lever (**50**) on the right side of the microtome base plate counterclockwise.
- Reposition the knife holder together with the knife holder base forward or backward as appropriate.
- Secure the clamping mechanism by rotating the lever (**50**) clockwise.

6.3.2 Knife holder E/E-TC

The knife holder E-TC is designed for the Leica TC-65 tungsten carbide blades.

Prior to inserting the blade, both knife holder and knife holder base must have been installed on the instrument!

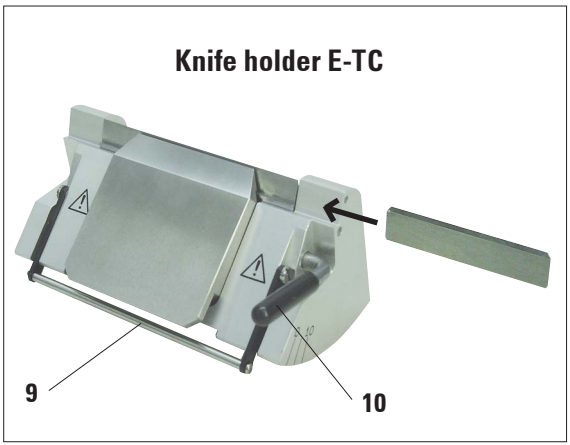


Fig. 33

Inserting the blades, knife holder E and E-TC

- Fold knife guard (**9**) downward.
- To insert the blade, flap the right clamping lever (**10**) forward and down.
- Carefully insert the blade from the side. Make sure that the blade is clamped parallel to the upper edge of the pressure plate.
- To clamp the blade, rotate clamping lever (**10**) back upwards.

The knife holder E is designed for conventional disposable blades from all current manufacturers. It is available in two models: one for narrow-band blades and one for broad-band blades. The knife holder has a lateral movement, so that the entire width of the blade can be used.

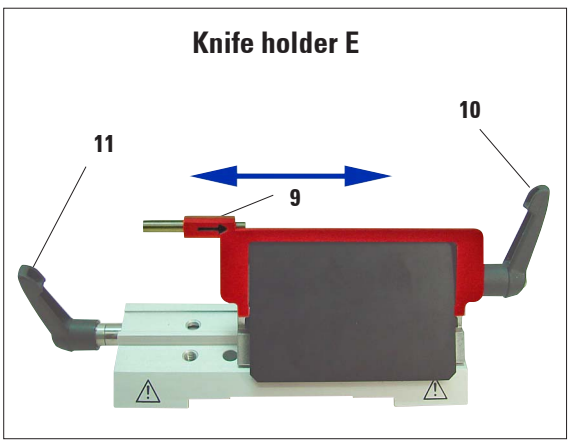


Fig. 34

The clamping levers on the knife holder are not interchangeable. The two clamping levers (10, 11) must remain in the position shown at all times, as otherwise isolated malfunctions of the knife holder can occur.
Clamping lever for the blade (10) at the right, clamping lever for the lateral displacement (11) at the left.

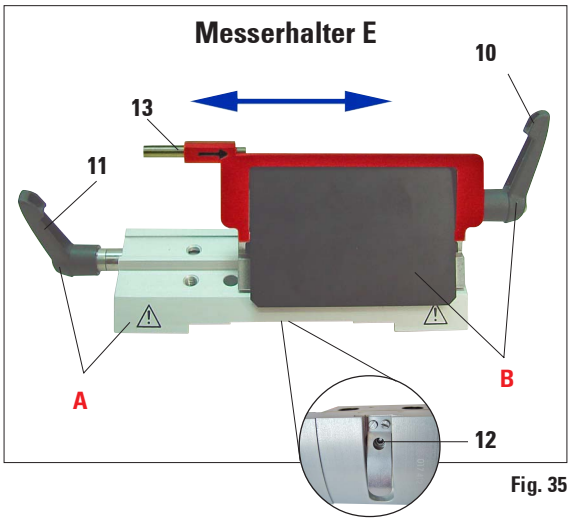


Fig. 35

Lateral displacement (only for kife holder E)

The lateral movement feature of the knife holder base enables the use of the entire length of the blade or knife, eliminating the need for readjusting the knife holder. The knife holder E consists of the segment arc **A** (with lever (**11**)), the clamping top **B** (with lever **10**) and ejection lever (**13**)).

The extreme left and right positions as well as the center position are each marked with a notch point.

- To release the clamping mechanism, rotate the lever (**11**) on the left side of the knife holder forwards.
- Move the knife holder sideways.
- To clamp, rotate the lever (**11**) back.

Note on knife holder E:

The knife holder E is an important precision component, the quality and precise adjustment of which have a lasting effect on the entire function of the microtome.

In cases of malfunction or damage to the clamping top, it is necessary to replace the entire clamping top, including its clamping levers.

For cases of malfunction or damage occurring after the warranty has expired, Leica Microsystems offers new clamping tops at a special price.

In this way, perfect function of the device can be ensured over the course of many years.

Adjusting the clamping power of the clamping top on the segment arc

To ensure good sectioning results, clamping top B must be securely clamped on segment arc A. Eccentric lever (**11**) is used for clamping. The clamping power is adjusted via screw (**12**) on the underside of the segment arc. The clamping power is correctly adjusted, when increasing resistance is noted when turning the clamping lever upwards to the limit stop.

To adjust the clamping power, first adjust screw (**12**) (with 2.5 mm Allen key) so that the lever slips, i.e. does not lock. Next, rotate screw (**12**) about $^{1}/_{4}$ of a turn to the left or right and check whether the lever clamps correctly (it should not slip but should not get jammed before it gets to the upper limit stop position either).

(There is also an excellent instruction video on the CD that comes with the manual).

6.3.3 Knife holder N/NZ

The knife holders N and NZ are appropriate for standard steel and tungsten carbide knives, profile c and d, up to 16 cm long. The integrated height adjustment feature allows you to also use knives that have been resharpened numerous times.

Mounting the knife support bar

- Push knife guard (**8**) to the center.
- Set the knife support bar (**46**) onto the height adjustment screws (not visible) as shown. The flat ends of the height adjustment screws must be located in the slots at each end of the knife support bar.

Prior to inserting the knife, both knife holder and knife holder base must have been installed on the instrument!

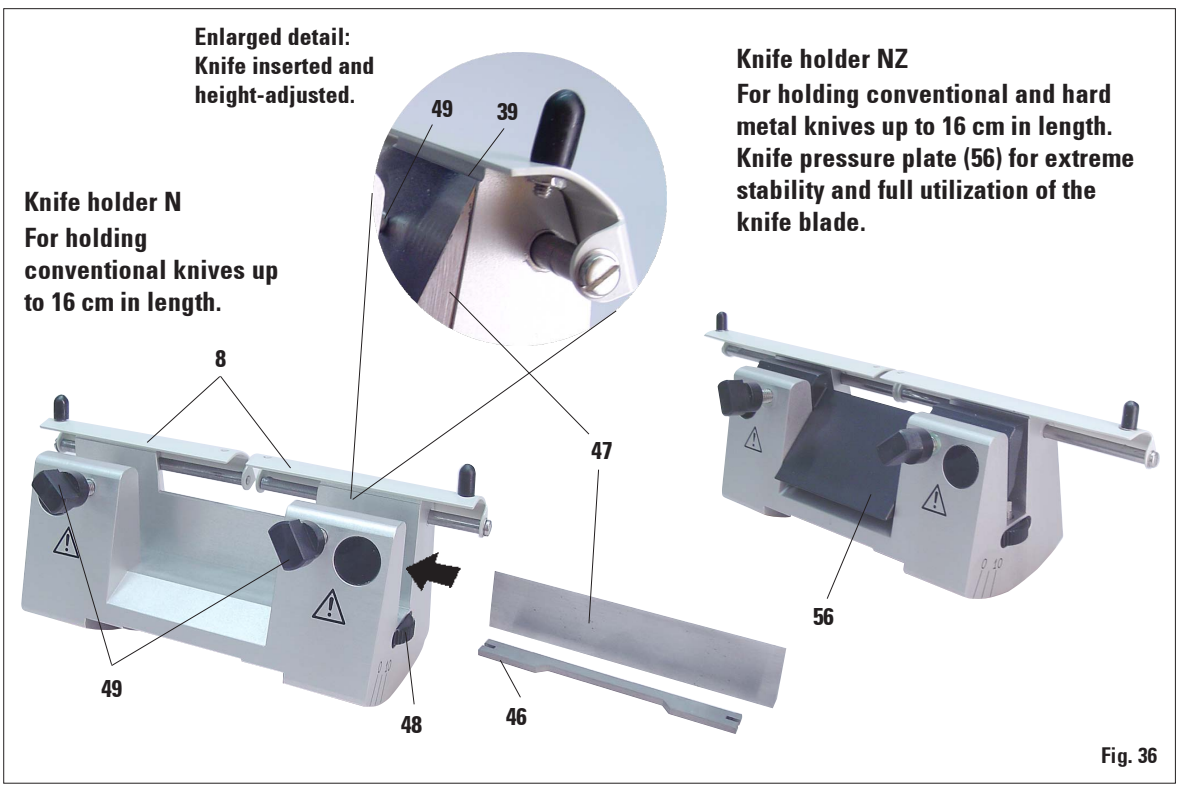


Fig. 36

Inserting the knife

- Rotate the knurled nuts (**48**) on the right and left of the knife holder forward in opposite directions, lowering the knife support bar to the lowest possible position, thus ensuring that the knife edge will not be damaged when inserting the knife.
- Unscrew the clamping screws (**49**) as far out as possible (rotate counterclockwise).
- Hold the knife (**47**) at the knife back and carefully insert it in the holder from the side as shown with the cutting edge facing upward.

Knife height adjustment

When adjusting the clearance angle, the knife edge should be positioned as exactly as possible in the actual center of rotation of the knife holder. Edge (**39**) of the rear clamping jaws serves as a reference position for correct knife height adjustment. The knife edge should be parallel with the locating edges.

- Rotate the knurled nuts (**48**) uniformly and backwards until the knife blade is parallel to the lay-on edge (**39**) (see detailed illustration) of the rear clamping chucks.
- To clamp the knife (**47**) evenly screw the two knife clamping screws (**49**) inward (rotate clockwise).

Lateral repositioning of the knife

- Push knife guard (**8**) to the center.
- Loosen the clamping screws (**49**) by turning them counterclockwise.
- Push the knife (**47**) to the left or right as required.
- To clamp the knife (**47**), always tighten the clamping screw (**49**) first which is located on the side to which the knife has been repositioned by turning it clockwise.

6.4 Section waste tray

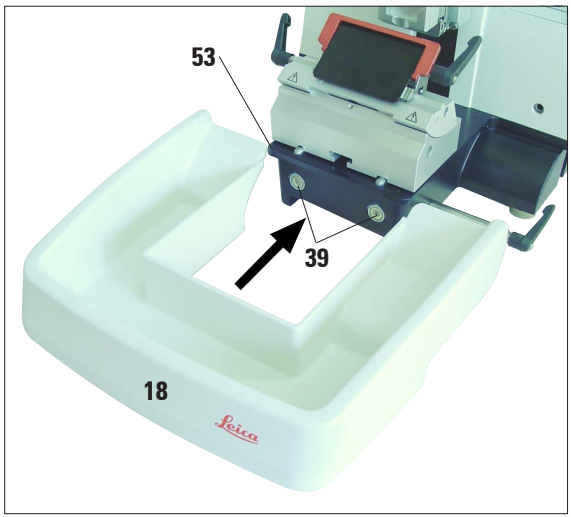


Fig. 37

- Push the section waste tray (**18**) from the front to the microtome base plate (**53**) until it is held in place by the two magnets (**39**) (on the front of the microtome base plate).
  To remove the section waste tray, lift it slightly and pull it off towards the back.

6.5 Backlighting

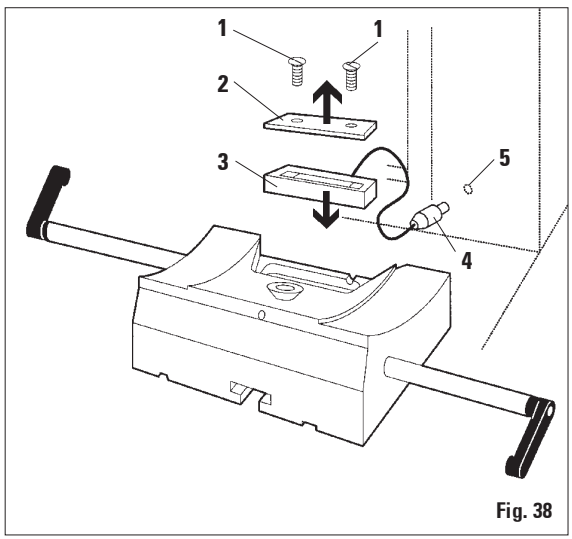


Fig. 38

The backlighting system is inserted into the one-piece knifeholder base from the front.

- Remove the two screws (**1**) using a slotted screwdriver and then remove the cover plate (**2**).
- Insert backlighting (**3**) into the recess.
- Connect the plug (**4**) of the backlighting system into the socket (**5**) on the microtome. Plug the power supply unit into the mains socket.

The backlighting illuminates once the microtome is turned on with the mains switch.

NEVER use the backlighting device in conjunction with the SuperMega cassette clamp.

6.6 Tray

Fig. 399

The tray is mounted on the hood of the microtome so that the small feet on the underside fit into the cutouts on the hood.
It is for storage of the utensils used during sectioning as well as the sectioned specimens.

6.7 Freezer pack

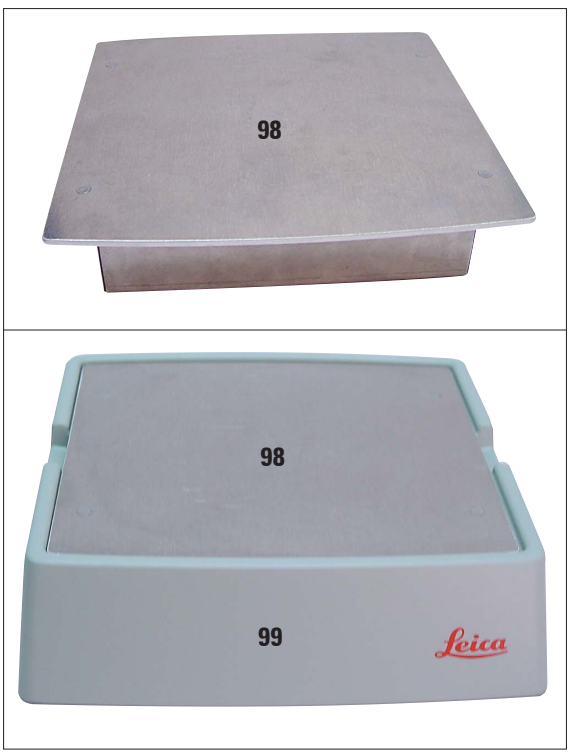


Fig. 40

The freezer pack consists of the cooling plate (**98**) and the insulation jacket (**99**). It serves for cooling paraffin specimens (or keeping them cool, resp.). Up to 35 standard cassettes can be cooled at the same time. The specimens require approx. 20 min. for being cooled from room temperature (approx. 20 °C) to "sectioning temperature".
The cooling performance depends on the ambient temperature and the volume of the specimens being cooled.
The insulation jacket can be placed on the hood of the microtome in the same manner as the tray, or it can be placed next to the instrument.

When using the freezer pack on the instrument the tray (Fig. 33) must be removed.

- Remove the freezer plate from the insulation jacket and place it in a deep freezer, ideally overnight (but for at least six hours) at approx. -23 °C.
- Reassemble the freezer plate and insulation jacket and place them on the bench or the instrument.

6.8 Ordering information

Fixture for specimen clamps, non-orienting, silver-colored		050238160
Fixture for specimen clamps, orienting, silver-colored		050238949
Fixturfor specimen clamps, orienting, silver-colored, with 2 zero reference point indicators		050237717
Quick clamping system, assy.		050237718
Knife holder base non-orienting, silver-colored		050237962
Knife holder N RM22xx, silver-colored		050237993
Knife holder NZ RM22xx, silver-colored		050237994
Knife holder E, for low-profile blades, RM22xx, silver-colored	(old)	050237958
Knife holder E for low-profile blades, RM22xx, silver-colored, with ejection lever	(new)	050240508
Knife holder E for high-profile blades, RM22xx, silver-colored	(old)	050237961
Knife holder E for high-profile blades, RM22xx, silver-colored, with ejection lever	(new)	050240509
Knife holder E, for low profile blades, with section floating bath RM22xx		050238961
Knife holder E, for high profile blades, with section floating bath RM22xx		050239114
Knife holder E-TC RM22xx, silver-colored		050237997
Standard specimen clamp w/adapter, 50 x 60, silver-colored		050238005
Standard specimen clamp w/adapter, 40 x 40, silver-colored		050237998
Vee insert for standard specimen clamp, silver-colored		050238000
Univ. cassette clamp w/one hand operation, w/adapter, RM22xx, silver-colored		050237763
Universal cassette clamp, ice-cooled		050237793
SuperMega clamp, assy., RM22xx, silver-colored		050238967
Foil clamp - type I, black-colored		040209307
Foil clamp - type 2, black-colored		040226922
Round specimen holder, silver-colored		050238001
Round specimen holder with adapter and 3 clamping chucks silver-colored		050238002
Clamping chuck, 6 mm diameter		035608322
Clamping chuck, 15 mm diameter		035609200
Clamping chuck, 25 mm diameter		035608320

Fixture for EM specimen holders, blaci	050229968
Universal specimen holder for EM specimens	035610868
Flat specimen holder for EM specimens	035510405
Special wrench for EM holders	035610869
Backlighting assy.	050238719
External power supply, assy.	050031244
Wrist cushion	050238768
Hand rest for waste tray	050238770
Freezer pack (freezer plate / insulation jacket), complete	050238325
Section waste tray	050237931
Section waste tray RM2265	050339060
Demo Box RM22xx series	050238930
Storage tray	050237932
'Leica' brush w/magnet	018340426

7. Trouble shooting

In the following table there is a list of the most common problems which can arise while working with the instrument, along with possible causes and troubleshooting procedures.

Problem	Possible cause	Corrective action
7.1 Possible faults		
1. Thick/thin sections The sections alternate between being thick and thin. In extreme cases, there are no sections whatsoever.	• The blade is not clamped properly.	• Reclamp the blade.
	• The blade is dull.	• Laterally displace the knife holder or insert a new blade.
	• The pressure plate is damaged or incorrectly adjusted.	• Insert a new pressure plate or use a new knife holder. • Readjust the pressure plate.
	• Clearance angle of the knife/blade too small.	• Methodically experiment with larger clearance angle settings until you have found the optimum angle.
2. Section compression The sections are very compressed, show folds or are squeezed together.	• The blade is dull.	• Use another area of the blade or a new blade.
	• The specimen is too warm.	• Cool the specimen before sectioning.
	• The sectioning speed is too fast.	• Reduce the sectioning speed.
3. "Stripes" in sections For knife holder E	• There is an accumulation of paraffin on the rear pressure plate of the knife holder.	• Remove paraffin from this area on a regular basis.
4. Noises during sectioning The knife "sings" when sectioning hard specimens. The sections show scratches or chatter marks.	• The sectioning speed is too fast.	• Turn the handwheel at a slower speed.
	• The clearance angle is too wide.	• Methodically reduce the clearance angle setting until you have found the optimum angle.
	• Insufficient clamping of object and/or knife holder.	• Check all screw and clamp connections on the object holder system and the knife holder. If necessary, tighten the levers and screws.
7.2 Instrument malfunctions		
1. There is no further feed motion and thus no sectioning.	• The front end position has been reached.	• Run the specimen back by turning the coarse driving wheel.
2. High blade consumption	• Too great of a sectioning force was applied.	• Adjust the sectioning speed and/or section thickness when trimming. Select a smaller section thickness, rotate the handwheel more slowly.

8.1 Cleaning the instrument

Always remove the knife / blade before detaching the knife holder from the instrument.
Always put the knives back into the knife case when not in use!
Never place a knife anywhere with the cutting edge facing upwards and never try to catch a falling knife!

When using cleaners, comply with the safety instructions of the manufacturer and the labor-safety regulations of your laboratory!
When cleaning the outer surfaces, do not use xylene or solvents containing acetone or xylene. Xylene or acetone will damage the finished surfaces!
Ensure that liquids do not enter the interior of the instrument during cleaning!

Before each cleaning carry out the following preparatory steps:

- Raise the specimen clamp to the upper end position and activate the handwheel lock.
- Switch the unit off and unplug it.
- Remove the blade from the knife holder and insert it in the receptacle at the bottom of the dispenser, or remove the knife from the knife holder and put it back in the knife case.
- Remove knife holder base and knife holder for cleaning.
- Remove the specimen from the specimen clamp.
- Remove section waste with a dry brush.
- Remove specimen clamp and clean separately.

Instrument and outside surfaces

If necessary, the varnished outside surfaces of the control elements can be cleaned with a mild commercial household cleaner or soap water and then be dried with a moist cloth.
To remove paraffin residue, xylene substitutes, paraffin oil, or paraffin removers such as “Para Gard” (Polysciences) can be used.
The instrument must be completely dry before it can be used again.

Cleaning the knife

When cleaning the knife, always wipe from the knife back towards the cutting edge, NEVER the other way round. Risk of injury!

For cleaning, use alcohol-based detergents or acetone.

Knife holder E

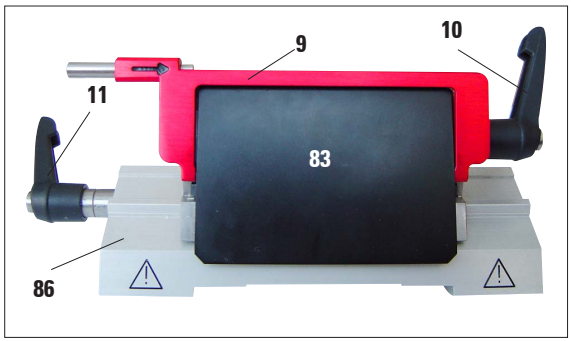


Fig. 41

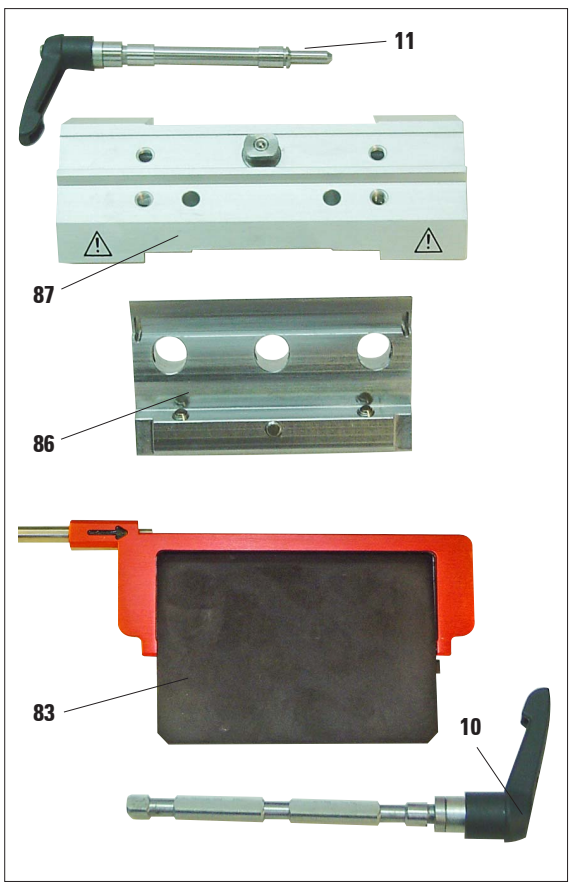


Fig. 42

Take the knife holder apart for cleaning. To do so, proceed as follows:

- Fold knife guard (**9**) downward.
- Rotate the clamping lever (**11**) of the lateral displacement forwards and pull it out sideways.
- Push the knife holder base plate (**86**) with the pressure plate (**83**) until it can be removed from the segment arch (**87**).
- Rotate the blade clamping lever (**10**) downward and pull it out sideways.
- Remove pressure plate (**83**).
- Clean all parts of the knife holder.

When cleaning several knife holders at the same time, be sure not to mix up the individual parts.

For cleaning and removal of paraffin, do not use xylene or cleaning fluids containing alcohol (e.g. window cleaner).

- Dry knife holder and reassemble.
- After cleaning the moving parts, apply a thin coat of oil for driving parts (see also Chapter 8.3).
- When installing the pressure plate (**83**), ensure that the upper edge is parallel to and level with the rear edge of the knife holder base (**86**) (see also Fig. 28, Page 30).

Universal cassette clamp

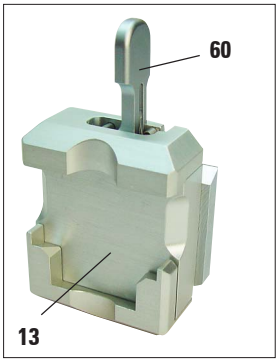


Fig. 43

- Detach cassette clamp for a thorough cleaning, removing all paraffin residues (**13**).
- For cleaning, do not use xylene. Use xylene substitutes or paraffin removers such as “Para Gard.”
- The cassette clamp (**13**) can also be placed in an oven heated to a maximum of 65 °C, until the liquid wax escapes.
- Remove paraffin residues with a dry cloth.
- After such a cleaning procedure in an oven, always be sure to lubricate the axle and spring of the clamping lever (**60**) (see also chapter 8.3).

8.2 Maintenance instructions

Only authorized and qualified service personnel may access the internal components of the instrument for service and repair!

The instrument is basically maintenance-free.
To ensure trouble-free operation of the instrument over a long period of time, the following is recommended by Leica:

1. Thoroughly clean the instrument on a daily basis.
2. Enter into a service contract at the latest at the end of the warranty period. For more information, please contact your local Leica technical service center.
3. Have the instrument inspected on a regular basis by a qualified service technician authorized by Leica.

   The intervals depend on how heavily the instrument is used.

We recommend the following inspection intervals depending on the general workload of the instrument as defined in the two categories listed below:

	Category I	**Category II**
Number of sections per day:	> 8.000 sections per day	< 8.000 sections per day
Workload (hours per day):	> 5 hours per day	≤ 5 h/day
Sectioning speed:	Predominantly high sectioning speed	Slow to medium sectioning speed.
Specimen material:	Working with soft and hard specimens	Working mostly with soft specimens.
Maintenance:	Every 12 months	Every 24 months

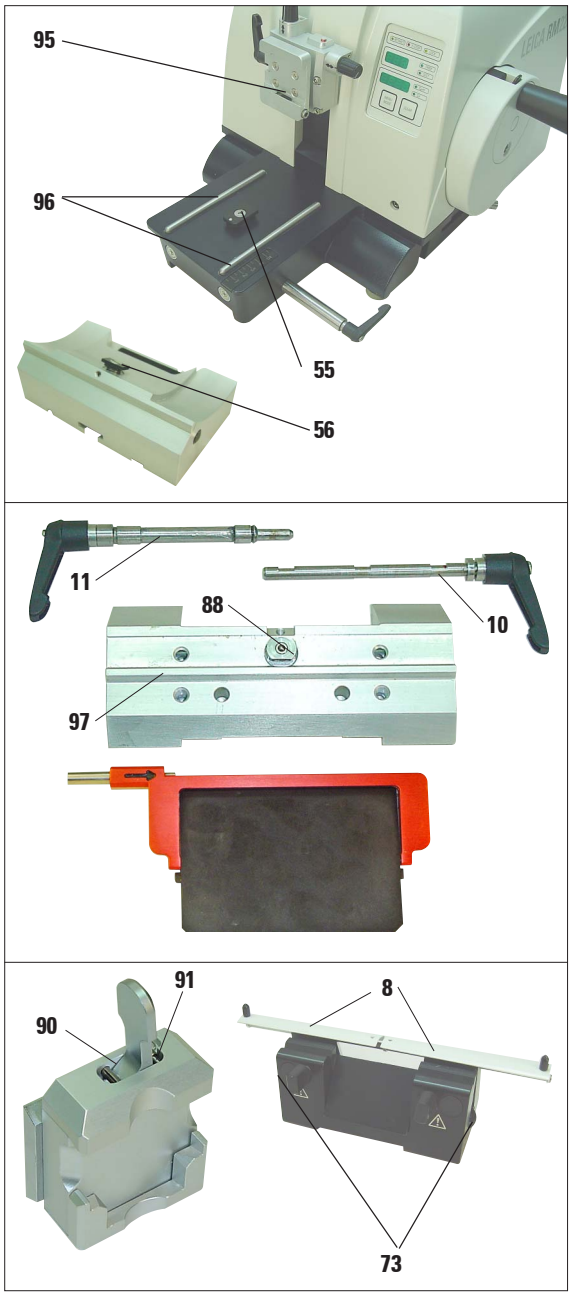


Fig. 44

8.3 Lubricating the instrument

Once a month, lubricate the following parts with the included drive parts oil No. 405 (1- 2 drops are enough).

Instrument and specimen holder :

- The clamping key (**95**) of the quick clamping system.
- The T-piece (**55**) on the microtome base plate.
- Guide rails (**96**) for the knife holder base on the microtome base plate.
- On the knife holder base the T-piece (**56**)

Knife holder E:

- Clamping lever (**11**) for the lateral displacement.
- T-piece (**88**) and guide (**97**) of the knife holder for the lateral displacement.
- Clamping lever (**10**) for the blade.

Knife holders N and NZ:

- Sliding surfaces of the finger guard (**8**).
- Knurled nuts (**73**) for measuring height adjustment.

Universal cassette clamp:

- Shaft (**90**) and flat coil spring (**91**) of the clamping lever of the cassette clamp. After lubrication, move the lever back and forth several times.

Warranty

Leica Microsystems Nussloch GmbH guarantees that the contractual product delivered has been subjected to a comprehensive quality control procedure based on the Leica in-house testing standards, and that the product is faultless and complies with all technical specifications and/or agreed characteristics warranted.

The scope of the warranty is based on the content of the concluded agreement. The warranty terms of your Leica sales organization or the organization from which you have purchased the contractual product shall apply exclusively.

Service information

If you are in need of technical customer service or spare parts, please contact your Leica representative or the Leica dealer where you purchased the unit.

Please provide the following information:

- Model name and serial number of the instrument.
- Location of the instrument and name of the person to contact.
- Reason for the service call.
- Delivery date

Decommissioning and disposal

The unit or parts of the unit must be disposed of according to existing local applicable regulations.